EECE5554 Robotic Sensing & Navigation

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Lab 2: Real Time Kinematic GNSS

RTK GNSS, or Real-Time Kinematic positioning, corrects common errors in current GNSS satellite navigation systems with the aid of a mobile receiver, or rover, to establish a data link and refine the recorded positional data. Because of the additional data correction, RTK GNSS can achieve significantly higher accuracy when compared to standard GNSS systems. RTK GNSS data may vary due to obstructions such as buildings or trees, and distance or communication issues between the rover and the base system.

The RTK GNSS system exhibits a substantial improvement in terms of accuracy when compared to the standard GNSS system. The data recorded in the stationary occluded scenario was within centimeters of accuracy, and the data from the corresponding open scenario was even more accurate. The northing vs easting data is plotted in Figure 1 below for both stationary scenarios.

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Figure 1: Northing vs Easting plots for both open and occluded stationary scenarios**

The occluded data, represented by the blue markers in Figure 1, fluctuates about the coordinate due to errors from obstructions. This may appear as a significant deviation, however, the variation in the occluded data is magnified by the graph scale. To visualize these fluctuations, the histograms of the variation in each dataset are shown in Figure 2 below.

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**Figure 2: Histograms for occluded (left) and open (right) stationary data**

The data variation histogram for the occluded data is more evenly spread out. While it may seem that the open dataset exhibits a similar variation in data, the scale is at the 10-9 power scale, which spreads the data out more. The occluded data was recorded at the Northeastern West Village area, which is surrounded by dorm buildings and trees, thus a wider spread of data deviation is expected. This is similar to the data collected in Lab 1, but the data scale is significantly smaller due to the smaller deviations.

In the moving datasets for both open and occluded scenarios, the open moving data appears perfectly straight. The occluded moving data has visible fluctuations in the path plot, which is likely a function of both nearby signal obstructions such as buildings and trees, but also to the presence of physical obstructions associated with the center of a crowded college campus. These plots are shown in Figure 3 below.

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AI-generated content may be incorrect. **Figure 3: Moving data for occluded (left) and open (right) scenarios**